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Ganyu Labour in Malawi: Understanding Rural Households' Labour Supply Strategies

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Understanding Rural Households' Labour Supply Strategies

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Abstract

In Malawi, informal off-farm labour (ganyu) has often been described as a survival strategy which eventually drives poor rural households into even further destitution. Based on data from the Second Integrated Household Survey for 2004, we estimate the determinants of the decision to supply labour in the ganyu market and the amount of labour supplied. Our results do not support the conjecture that ganyu is necessarily a low-return strategy that confines subsistence constrained households to a vicious circle of poverty. However, we do find evidence that ganyu is used as an ex-post coping strategy in the event of shocks, and as an ex-ante social insurance mechanism. Moreover, we generally find a positive reaction of ganyu supply to an increase in the ganyu wages, and no evidence of any backward bending segment of the supply curve for households close to the subsistence level. While ganyu does not appear to drive poor households into further destitution, these households do seem to suffer the most when they face demand side constraints in times of greatest needs.

1. Introduction

During the past several decades, a growing literature has focused on the evolution of well-being and the tendency of individuals, households and communities to be trapped in chronic poverty (Azariadis and Stachurski, 2005; Barrett and Swallow, 2006; Carter and Barrett, 2006). A special class of poverty trap models relies on the existence of multiple dynamic equilibria, with at least one of them lying below the standard poverty line. Shocks that push people below the poverty threshold knock them into a downward spiral of destitution (Carter and Barrett, 2006; Dercon, 1998, 2005). When the threshold is defined at the subsistence level, individuals are likely to collapse into a nutritional poverty trap (Dasgupta, 1993; 1997; Dasgupta and Ray, 1987).

There is evidence suggesting that a vast majority of rural households in Malawi are close to, or below the subsistence threshold, with few income diversification options other than cropping activities (Devereux, 1999; Whiteside, 2000). As a result, they may end up selecting low-risk, low-return portfolios that presumably lower the risk of hunger, but paradoxically push them into the spiral of greater destitution (Barret et al., 2008). G*anyu* – off-farm informal labour, usually on somebody else's farm – has often been described as such a paradoxical risk management mechanism. According to data from the Second Integrated Household Survey for 2004 (Malawi Government, 2004) about 52% of all rural households offer ganyu.

Whiteside (2000) argues that subsistence constrained households tend to supply more ganyu the lower the wage, and neglect production on their own fields in order to meet the ganyu supply requirements. Taken together, the low income received for their work outside the farm, and the next period's decreased productivity on their neglected farms, push these household into a poverty trap.

This perception of ganyu has long been stylised in the literature and has become a starting point of a number of studies on poverty in Malawi. The more general literature on agriculture in Malawi seems to suggest that the subsistence constraint that leads to ganyu may be a result of structural anomalies such as small land sizes, credit constraints and labour and fertilizer shortages (Alwang and Siegel, 1999; Orr, 2000; Orr and Mwale, 2001; Ellis et al., 2003; Harrigan, 2003). However, most of this research uses regional surveys prior to the time when the effect of the 1990s' structural reform could be widely felt[1] and few of these studies address the issue of ganyu labour explicitly.

Only recently, a formal test of the hypothesis that ganyu labour represents a (seasonal) poverty trap has questioned the stylised perception of ganyu labour. Orr et al. (2009) have argued that the supply of ganyu does not necessarily have a causal effect on the consequent neglect of one's own field and subsequent reduction in own farm productivity. Indeed, the authors show that ganyu may not even be a result of a binding consumption constraint, but may instead represent an important source of additional income to be used for the purchase of fertilizer and other productivity promoting activities.

We intend to follow up on these observations, by providing a more systematic labour market framework and empirical tests based on a recent national survey. In particular, we would like to contrast the different perceptions of ganyu labour and find out whether it is a low-return strategy that confines subsistence constrained rural workers to a vicious circle of poverty (Whiteside, 2000) as opposed to the typical off-farm labour supply mechanism explored in the income diversification literature that focuses on ways to escape the poverty trap (Orr et al., 2009; Barrett et al., 2001; Reardon et al., 1992; Dercon and Krishnan, 1996). In doing so, we also consider some less popular explanations of the phenomenon of ganyu labour, such as ganyu being either an ex-ante risk mitigating strategy that creates a long-term

[1] For detailed review of structural reform policies in Malawi during the 1990s, see Harrigan (2003). These included mostly crop diversification out of maize into non-traditional agricultural crops and the introduction and subsequent removal of fertilizer subsidies.

relationship between employers and employees or an ex-post coping mechanism used when misfortune strikes. These mechanisms have attracted a lot of attention in both the general literature on rural market insurance, income diversification and poverty (e.g. Kochar, 1999; Dercon, 2004) and in the ethnographic literature on Malawi (e.g. Englund, 1999), but have largely been neglected by economists studying ganyu labour in Malawi.

To set the scene, Section 2 presents some descriptive statistics based on the Second Integrated Household Survey to discuss the relevance of ganyu in rural Malawi, and the general characteristics of households that participate in the ganyu labour market. In Section 3, we develop a conceptual framework to derive concrete hypotheses about the households' strategies when they offer ganyu. The methodology used for testing these hypotheses is discussed in Section 4. In Section 5, we present our estimation strategy and our econometric results. Section 6 concludes.

2. Ganyu labour in rural Malawi: A general overview

To assess the phenomenon of ganyu labour in rural Malawi we use the Second Integrated Household Survey 2004, available upon request from the World Bank. Data were collected between March 2004 and March 2005. The survey covers a stratified random sample of 11 280 households (including a total of 52 702 individuals or 0.42% of the Malawi population), over the whole area of the country. As ganyu is predominantly a rural phenomenon, and labour supply decisions by non-agricultural households generally tend to be based on different considerations, we restrict our sample to agricultural households, which represent approximately 89% of the sample. This reduces the sample size to 10 032 observations.

Table 1 highlights the prevalence of ganyu in Malawi and shows the characteristics of the households participating in the ganyu labour market. The first line shows that ganyu is a wide-spread phenomenon. During the year of the survey, more than half of the rural

households in Malawi (44% + 9%) supplied some ganyu, and about one quarter (16% + 9%) recruited ganyu.

A particularly noticeable feature is that as significant share as 9% of the households engage in both supply and demand of ganyu. A plausible explanation of the simultaneous supply and demand of ganyu labour could be the exchange of agricultural and non-agricultural ganyu chores in the market. For instance, a household may have members working on other people's fields, while also hiring ganyu labour for activities such as home construction or brick burning. Moreover, simultaneous ganyu supply and demand could also be a result of a desire to build building a social network on which households may count in times of need. This could explain the exchange of workers even within similar and purely agricultural activities.

<< Insert Table 1 about here>>

The following rows provide some information on the well-being of households. The first indicator represents the headcount poverty rate, defined by the World Bank as the proportion of people falling below the poverty line of 16 165 Malawi Kwacha (MK) per person per year or 44.3 MK per person per day (corresponding to 0.42 USD at 2004 exchange rates). The second indicator is the anthropometric measure of severe malnutrition 'weight for age'. Children under 5 years are considered severely undernourished if their weight falls 3 standard deviations or more below the standard reference weight provided by the WHO for the corresponding age group (WHO, 2007). As opposed to anthropometric measures based on height, this indicator measures the impact of recent, rather than long-term, restrictions in

nutritional intake (Sahn and Stifel, 2002). Finally, we consider whether the household has a corrugated iron roof, which is a key indicator of wealth in rural Malawi.[2]

For the population as a whole all of these indicators indicate wide-spread poverty. In all groups, the poverty incidence is substantial, severe child malnutrition ranges between 5% and 9%. However, the comparison of ganyu supplying and ganyu recruiting households indicates that on average and despite overall poverty, the latter are significantly better off than the former. Figure 1 confirms this observation by showing a clear decrease of ganyu supply and increase of ganyu demand with the increase of household consumption expenditures. Nevertheless, it should be noted that there is an incidence of over 30% of ganyu supply even among the richest households. This suggests that ganyu is a more complex phenomenon than simply one of the 'rich' exploiting the 'poor' (Bryceson, 2006).

<< Insert Figure 1 about here>>

Returning to Table 1 we can compare some additional characteristics of ganyu supplying and demanding households. On average, ganyu supplying households are slightly smaller, much more often headed by females (which may be another, more indirect indicator of destitution, see Green and Baden 1994; Bryceson, 2006; Devereux, 1999), and considerably less educated.

Agricultural cultivation appears to be similar for both groups, with a strong focus on maize throughout. While cash crops are grown more frequently by ganyu demanding households, they are very common for ganyu supplying households, too. Furthermore, the high yielding variety of hybrid maize is now widespread, as opposed to the early 1990s when hybrid maize was hardly ever produced by local subsistence farmers (Green and Baden, 1994; Sahn et al., 1990). However, Table 1 indicates that the share of uncultivated land is noticeably

[2] We thank one of the anonymous referees for pointing this out to us.

higher for ganyu supplying households. It is possible that a family member providing ganyu cannot always be easily replaced.

As might be expected, the means of most variables for households that both supply and demand ganyu are somewhere in-between those of households that either only supply or only demand ganyu. The most noticeable exception is that of the average number of household members. Households engaged in both ganyu supply and demand appear to be significantly larger than households engaged in only supply or only demand (which in turn, are significantly larger than those engaged in neither of the two). Apparently, relatively large households are more frequently involved in the exchange of family members' labour via ganyu.

Let us conclude our overview of ganyu in Malawi by looking at the regional and seasonal spread of the phenomenon. Figure 2 presents the share of households involved in hiring ganyu by season and district. As a seasonal differentiation is not available for supply, we use the hiring data to reflect the overall prevalence of ganyu. Households in urban districts are included if they are engaged in agricultural activities.

<< Insert Figure 2 about here>>

Figure 2 indicates considerable differences in the prevalence of ganyu across regions. Generally, ganyu is less frequent in the northern part of Malawi. In addition, it becomes clear that ganyu is much more relevant in the rainy than in the dry season. This may be related to a stronger need of workers during the rainy season, but also to the fact that the end of the rainy season (January to March) corresponds to the period of greatest difficulty to meet consumption needs. The main harvest takes place during the dry season (March to October) and generally ensures at least a minimum level of consumption.

3. Ganyu supply decisions: Conceptual framework and hypotheses

While the preceding section has provided us with a general overview of ganyu in Malawi and possibly suggested some initial lines of thought regarding its determinants, we are now going to propose a more systematic conceptual framework in the context of which different ganyu supply decisions can be assessed. As ganyu represents a wage labour choice for farm households, the traditional model of off-farm labour supply by farm households (e.g. Benjamin, 1992; Rosenzweig, 1980; Huffman, 1980) provides a natural starting point for our analysis. In this model, the off-farm labour supply decisions of farm households are a result of maximization of a household utility function subject to constraints on time, income and farm production. Households are assumed to maximise utility from consumption goods (C), leisure (L), and demographic factors exogenous to the current household consumption decisions, such as the members' age and household size (A). The utility function:

$$U=U(C, L; A) \quad (1)$$

is assumed to be ordinal and strictly concave.

The household faces the above mentioned three constraints on its resources. First, the total time endowment of household members (T) is allocated across farm work (T^f), off-farm work (T^{off}) and leisure (L):

$$T=T^f+T^{off}+L \quad (2)$$

Secondly, the household income received from members' off-farm work at wage rates (w^{off}), net farm income (p^fQ-w^fH), and non-labour household income (V) is spent on consumption goods:

$$w^{off} T^{off}+(p^fQ-w^fH) +V=p^cC \quad (3)$$

where p^f and p^c are the prices of farm output Q and consumption goods C respectively, w^f is the wage for work on the farm, and H is hired labour. Assuming that purchased consumption and produced output are sold on a single competitive market, we can set $p^f=p^c$,

which implies that it does not matter whether the farmer sells his production or directly consumes it.

Finally, the properties of the farm production function restrict the potential size of the household budget. Farm output is produced by members' time inputs on the farm, hired labour, and a vector of semi-fixed inputs (X) such as the amount and quality of land or farmer's education. The production function is thus given by:

$$Q=F(T^f, H; X) \tag{4}$$

It is assumed to be strictly concave, so that the farmer's optimisation problem can be solved.

Utility maximisation then leaves us with a reduced form equation of off-farm labour supply (ganyu supply) as a function of the off-farm wage, the on-farm wage (which in turn depends on semi-fixed farm inputs relevant for productivity), prices of consumption goods, non-labour income and demographic characteristics of the household:

$$T^{off}=S(w^{off}, w^f(X), p^c, V, A)\geq 0 \tag{5}$$

In this framework, all factors of production are paid prices equivalent to their marginal productivities and hence resources are allocated towards their most productive uses. In our context, given that off-farm and on-farm labour are considered to be essentially very similar activities, competitive markets should even lead to an equality between w^{off} and w^f (as in Benjamin, 1992). This is a special case of our model.

Generally, as long as productivity differences can occur, the increased on-farm productivity will lead to higher $w^f(X)$, induce a substitution between the two types of work, and therefore reduce ganyu supply (Rosenzweig, 1980). A rise in the price of consumption goods p^c makes leisure relatively more costly and should therefore lead to a reallocation of time towards work, including ganyu. By contrast, higher non-labour income (V) relaxes the budget constraint and induces the household to work less. Relevant household characteristics (A), like age and number of adults, predominantly affect the preference for leisure because

young children and elderly people cannot easily bear long work hours (or may not be able to work at all).

Let us finally consider the effect of a rise in the wage for ganyu (w^{off}). This is most interesting in our context as it is closely related to the current debate on ganyu in the literature. A change in ganyu wage leads to opposing income and substitution effects with respect to leisure. As long as leisure is a normal good, the substitution effect dominates so that rising wages lead to higher ganyu supply. This is reflected in the typical upward sloping labour supply curve we generally observe. We would also expect a substitution effect between on- and off-farm work which should further strengthen the positive relationship between ganyu wages and ganyu supply.

Nevertheless, there may be situations in which the income effect of a change in w^{off} becomes so strong that it dominates over the substitution effects. Thus the total impact of w^{off} may be ambiguous (Huffman, 1980). Standard textbooks on labour economics would usually consider a backward bending labour supply curve for very high wages. In this case, an increasing wage does not make work much more attractive than leisure any more, so that the substitution effect becomes relatively irrelevant and is dominated by the income effect. However, in the context of a very poor country such as Malawi, another situation would appear more relevant.

Consider that, in addition to the constraints discussed in the model above, the households face a **subsistence constraint.** In this situation, households are so poor that they need to compensate any decrease in wages by an increase in working time to meet their subsistence needs. In this case, the income effect dominates, too, and we again obtain a negatively sloped labour supply curve. This is the situation Whiteside (2000) seems to have in mind in his discussion of ganyu in Malawi.

Finally, as highlighted by Dessing (2002), there may be situations where, even with maximum labour input, households are not able to cover their subsistence needs. In this case,

people lose health, strength and energy so that even their otherwise exogenous time budget (T) becomes endogenous and begins to shrink. While they continue to provide maximum possible labour, decreasing wages will further reduce T so that we get to a positive relationship between labour and wages. Figure 3 presents the corresponding labour supply curve.

<< Insert Figure 3 about here>>

As highlighted by Dessing (2002), what primarily matters for the slope of the wage to be expected in a poor country is the distance of the households from the subsistence constraint. In the context of rural Malawi, productive activities on-farm (and possibly other non-labour income) also contribute to meeting the subsistence constraint. Therefore, rather than comparing the slope of the labour supply function for different ranges of the ganyu wage, it appears to be appropriate to compare the slopes by different income groups. If ganyu is indeed used as a means to ensure food security and to comply with a given subsistence constraint, in analogy to Dessing (2002), we should find evidence for the following hypothesis:

H1: As opposed to other households, for households with incomes close to the subsistence level, there is a negative relationship between ganyu wages and ganyu supply.

In addition, if, rather than representing a general alternative to on-farm labour supply as suggested by the model outlined above, ganyu is supplied predominantly as a last resort strategy to meet the subsistence constraint (Whiteside, 2000), there should be evidence for the following hypothesis:

H2: Ganyu is supplied predominantly by households close to and under the subsistence level.

Another, complementary and partially related explanation of ganyu supply could be its use as an **ex-post coping strategy in response to shocks**. In line with the above arguments

on ganyu as a means to ensure a certain minimum income, this effect can be expected to be strongest for low-income households. More generally, the idea is that on-farm production processes may not allow the household to optimally reallocate resources immediately after a shock. If the ganyu labour is flexible and capable of accommodating the additional rural labour released, an increase in ganyu supply can be used to smooth consumption. This argument goes again beyond our simple neoclassical model, as this model does not consider adjustment or any kind of transaction cost. We can summarize it in the following two hypotheses:

H3: Ganyu supply increases in the event of a shock.

H4: The poorer the household, the stronger is the increase of ganyu supply after a shock.

Finally, the literature on Malawi as well as some of our descriptive statistics in Section 2 suggest that ganyu may be used to forge **long-term social relationships**. Indeed Englund (1999) and Whiteside (2000) note that households sometimes supply ganyu even in periods when they do not have to struggle to meet their consumption constraints and when, at the same time, their labour is highly productive at home. The authors explain this situation by the fact that in order to make sure that they will be able to supply ganyu in periods of need, rural households tend to supply ganyu even at times when they do not need to do so. In this case, ganyu would thus be used ex-ante, ahead of any shocks, in order to sustain the employer-employee relationship – like some kind of a risk insurance based on social networking.

Again, in this context, our simple neoclassical model of efficient resource allocation in rural Malawi will fail to make accurate predictions. Conceptually, one could represent this situation as an extension to the baseline farm model by including decision-making under uncertainty, along the lines of the two-period insurance/consumption smoothing models suggested in the literature (e.g. Kochar, 1999; Rose, 2001). The household makes both

production and labour supply decisions in each period, namely the period prior to which a shock affecting production is realized and the period when the value of the shock has been revealed. The implication of this framework is that, aside from the usual determinants of off-farm labour supply, risk (and or shock) expectations will be taken into account. We therefore formulate the following hypothesis:

H5: Rural households use ganyu as an ex-ante networking strategy to cope with future shocks.

As consumption smoothing can be considered to be most relevant for the poor (see e.g. World Bank, 2007), but yet, the smoothing strategy is reported by Eglund (1999) and Whiteside (2000) for households at times they are not in extreme need, we should expect to observe this mechanism particularly for some intermediate income groups. This leads to our final hypothesis:

H6: Ganyu as an ex-ante networking strategy is most frequent for poor, but not extremely poor households.

Before proceeding, note that our different hypotheses are not mutually exclusive. Households may simultaneously follow several strategies with their supply of ganyu. Moreover, different types of households may have different priorities. In the following, we will try to assess to what extent any or all of these strategies can be observed in rural Malawi, and to what extent the use of these strategies depends on the level of income.

4. Empirical strategy

Using the data from the Second Integrated Household Survey 2004 already described in Section 2, we will examine the above hypotheses in a straightforward labour supply regression. A detailed description of all variables can be found in the Annex, Table A1. The absolute number of days a household provides ganyu during the year of the survey represents our dependent variable. Our control variables are all directly based on the basic off-farm

labour supply model introduced above. In addition, we introduce a few specific variables to test our hypotheses.

To assess the relevance of ganyu as a last resort strategy to cope with a binding subsistence constraint, we proceed as follows:

First, the impact of wages on ganyu supply is estimated for different income groups. In keeping with the literature on on- and off-farm labour supply (Rosenzweig, 1980) we proxy the ganyu wage with the regional wage rates, obtained by dividing the total amount paid by farmers hiring ganyu by the days of ganyu labour employed and averaging this daily wage rate within the district. If H1 is correct, there should be a negative relationship between ganyu wages and ganyu supply for the income group around the subsistence level, while this should not be the case for other income groups. In the Malawi Household Survey, the subsistence level is indicated by a calorie based minimum intake per capita corresponding to an annual expenditure of 16 541 KW (ca. 155 USD) which is similar to the national poverty line (cf. Section 2). The subsistence level falls in the second lowest expenditure quintile. Households in the second expenditure quintile are thus all relatively close to the subsistence level. If H1 is correct, their ganyu labour supply function should respond negatively to ganyu wages. For the lower expenditure quintile and the higher expenditure quintiles, the Dessing (2002) arguments would lead us to expect a positive relationship.

Second, we assess H2 which claims that ganyu is supplied predominantly by households at or under the subsistence level. The most straight forward procedure here is to simply include a dummy variable for households at or under the calorie based minimum intake expenditure defined above. If H2 is correct, this dummy variable should have a positive and significant coefficient in our regression.

However, this is only a necessary and not a sufficient condition for the acceptance of H2. A positive coefficient of the dummy variable would also be consistent with the generally negative impact of increased income on labour supply – just as the income effect induced by

non-labour income V discussed in the context of our model in Section 3. If there is a specific relevance of the subsistence constraint in our context, we should find a very strong effect on ganyu supply when households cross this particular expenditure level, and only a much smaller effect elsewhere. Introducing the expenditure quintiles as individual dummy variables into our ganyu supply regression, H2 would thus lead us to expect a noticeably strong jump between the coefficients of quintile 2 and quintile 3.

Let us now discuss how we can find out whether ganyu is used as an ex-post coping strategy in the event of a shock. In the Malawi Household Survey, families were required to report information on the occurrence of different types of shocks such as death or illness of family members, theft and damage, natural disasters, or a sharp rise in the price of consumption goods. H3 claims that these shocks should increase ganyu supply. However, we cannot simply add a general shock dummy into our regression because different shocks may have different impacts. This may affect the timing and the intensity of the effect. For instance, if the household is hit by death or severe illness of one of its members, not only household income, but also available labour time will be affected. Even if the income effect of the shock induces the household to supply more ganyu, this effect could be partially offset by the reduced availability of labour in the family. In cases of damage or theft, only the income effect is relevant, but it might be less severe than in the case of a loss of family members. Yet other shocks, like floods or droughts or an increase in the price of consumption goods, are relevant for a whole village and not only for individual households. In this case, many people might want to supply more ganyu and (despite flexible prices) the ganyu labour market may not be able to absorb them all. Hence, their supply could be restricted by the reduced demand. The constraint would be greatest if the fields of farmers that usually hire ganyu are also affected by the shock.

While we do not have theoretical foundations behind possible differences in the effect of the different shocks, the plausible existence of such differences make us consider the effect

of all above mentioned types of shocks as three separate dummy variables, i.e. (i) household shocks due to accidents, illness or death of working-age members of the household, (ii) household shocks due to damage or theft, and (iii) village shocks due to droughts, floods, crop pest or a sharp rise in food price.

These shocks may also have their effect on ganyu supply within a different time horizon. While we would expect a household level shock to call for immediate adjustments, the immediate consequence of most village level shocks will be bad harvests. While people will usually still have enough food during the harvesting time itself, food stocks will often be exhausted before the next harvest, thus increasing the desire of households to supply ganyu. We therefore consider the effect of village level shocks with a one-period lag. To find out whether the use of ganyu as an ex-post coping mechanism after shocks is particularly relevant for the poorer households (H4), we will test the argument separately for the different expenditure quintiles.

Finally, we would like to find out whether rural households use ganyu as an ex-ante networking strategy to cope with future shocks (H5), especially when they fall into some intermediate income range (H6). A direct test of these hypotheses would be possible only in a multi-period framework where household behaviour could be observed before and after the shock. However, high quality panel data that could easily track ex-ante and ex-post reactions to shocks is not available in our case. Other authors examining rural household behaviour faced similar constraints. Hence, aside from Rose (2001), most of the literature testing the insurance mechanism behind off-farm labour supply has relied on cross sectional data and explored the impact of contemporaneous shocks on contemporaneous off-farm labour supply.

However, finding a positive impact of shocks on off-farm labour supply at a given point in time is not sufficient to infer the existence of an insurance mechanism, even if wage adjustments are controlled for. In fact, finding such a positive impact only supports the existence of the ex-post adjustment mechanism already discussed above. How then can we

assess whether, in addition, people use ganyu as a social networking or insurance mechanism ex-ante?

We follow an indirect approach. If, as suggested by Whiteside (2000) and Egglund (1999), social networking through ganyu at normal times is required to be able to supply more ganyu in times of need, a household suddenly facing a shock would find it difficult to enter the ganyu market if it has not been active in this market before. We will test this argument by estimating a separate probability to supply ganyu equation along with the general ganyu supply function. If ganyu is only an ex-post coping mechanism available independently of social networking through ganyu ex-ante, the probability to enter the ganyu market on the supply side and the number of ganyu days supplied (conditional on entry) should be determined by the same factors. In particular, household and village shocks should then have a positive effect not only on the number of ganyu days supplied, but also on the probability to enter the ganyu market. If, however, shocks do not have any significantly positive impact on market entry, while they do have a significantly positive effect on ganyu days supplied, we will interpret this as evidence for the existence of a social insurance mechanism. To see whether the use of this mechanism differs between income groups, we will again consider regressions by expenditure quintile along with the overall regression across all households.

Before concluding this section, let us briefly discuss our control variables derived in the model in Section 3. To capture own-farm productivity and thus, indirectly, the (shadow) wage of own-farm production $w^f(X)$, we could use a number of characteristics of the land, the type of crops, crop diversification, the use of fertilizer etc. However, many of these variables may not be exogenous. We thus retain only one indicator variable of a particularly small plot (<0.5 hectares), and another indicator variable for production during the dry season (which is only possible in certain locations). Neither of these is likely to change in the short run. The possibility to produce during the dry season clearly increases the farm's overall productivity and should thus have a negative effect on off-farm labour. Conversely, small land size should

have a negative effect on productivity as it does not allow the efficient use of machinery such as ploughs etc. In addition, in Malawi, land sizes smaller than 0.5 hectares imply that a household is practically landless, a fact that can be expected to reinforce the positive effect on ganyu supply (Green and Baden, 1994).

As an additional determinant of own-farm productivity, we consider human capital. Two types of measures of human capital have been used in household level labour supply equations, namely the education and age or experience of the head of household and the average levels of education and age of the household members. Since the human capital characteristics of household members are typically highly correlated and the measures for the household head are less likely to be endogenous (Rizov and Swinnen, 2004), we give preference to the former. Specifically, we define our educational indicator as the years of education, and the experience indicator as the age of the household head.

One could argue that human capital should increase the productivity of ganyu as much as it increases the productivity of on-farm labour, so that the overall effect on ganyu supply could be ambiguous. However, the human capital intensity of most ganyu activities is typically low, with less scope for innovations than activities on one's own farm. For this reason, we expect the positive productivity effect on one's own farm to dominate, and the effect on ganyu supply to be negative.

Apart from on-farm wages and their determinants, the model requires control for food prices (p^c), for non-labour income or wealth (V) and for relevant household characteristics (A). Changes in the prices of food are included in our village shock variable, at least if they are substantial. As a proxy for wealth, that is not directly related to labour, we introduce the presence of an iron roof discussed in Section 2.

In so far as household characteristics are concerned, we primarily attempt to capture the work capacity of the household, which is proxied by the number of adults (15-65 years) and by the proportion of dependents, i.e. of children under 15 and elderly people. We expect a

positive effect on ganyu supply of the former, and a negative effect of the latter. Moreover, we include a control variable for female headed households as the latter may have an impact on the general restrictions faced by the family. In keeping with the literature, we expect that ganyu supply in female headed households will be higher. Finally, we introduce a dummy variable for northern regions, since our descriptive statistics suggested that different traditions in different parts of the country also affect ganyu supply. Based on the results presented in Figure 2, we expect ganyu to be much more wide-spread in the south.

5. Econometric methods and empirical results

To estimate the ganyu supply function we use a tobit model in order to take into account the censored nature of our data. Obviously, households can only choose either a strictly positive ganyu supply or a corner solution of zero. As we are not interested in the effect of our explanatory variables on some rather artificial latent concept such as the "preference for ganyu supply", but on the actual (positive) days of ganyu labour supplied, we will not directly present the coefficients of the tobit equation (cf. Wooldrige, 2002: 518 and 520ff.). Instead, we present marginal effects with respect to the expected number of days of ganyu supply, given that this supply is positive E(ganyu days | ganyu days>0).

To separately estimate the households' probability to enter the ganyu market on the supply side, we estimate a simple probit model for Pr(ganyu days>0). To facilitate the interpretation of our results, just as for the tobit model, we display the relevant marginal effects (setting all variables at their mean).

Before presenting the results, a few additional estimation problems need to be considered. First, our data is drawn from a stratified random sample, so that observations within strata may not be fully independent. This could lead to an underestimation of standard errors and thus an over-confidence in our regression results. To avoid this problem, for the probit model, we use the Huber-White sandwich estimator of the variance-covariance matrix

as implemented by the STATA survey data commands. However, in the tobit case, the variance-covariance matrix cannot be adjusted in the same way. As an alternative, we determine our standard errors through bootstrapping which also allows us to take stratification into account.

Second, there may be concerns with respect to the possible endogeneity of some of our variables. This concern may arise with respect to ganyu wages. If overall supply of ganyu is high, wages may decrease, which would create a problem of reverse causality. However, we consider supply by individual households, and assume the relevant labour market to be regional. The regional wage rates for the 26 Malawi districts should not be influenced by individual supply decisions.

Endogeneity may also be a problem with respect to different variables used to capture own-farm productivity. As discussed in Section 4 above, we are already quite selective with the inclusion of these variables, keeping only those which can most plausibly be assumed to be exogenous. Thus, the availability of only a small area for own cultivation does not appear to be something which can be easily changed, and the cultivation of crops in the dry season depends to a large extent on external factors such as the geographic location of the farm. To be sure, we carry out an endogeneity test using the two-step procedure for tobit models outlined by Wooldridge (2002: 530f.). The instruments used are the regional share of small area farms and the ethnic background of the household head, respectively. We thereby cover geographical and cultural factors which should be truly exogenous, and which are highly correlated with our variables of interest. Using these instruments for the above mentioned test, the hypothesis of exogeneity of our initial variables cannot be rejected at any conventional level of significance. We therefore stick to the initial variables in our regressions, and consider them as exogenous.

On the basis of this discussion, we can now present our empirical results.

Table 2 shows the outcome of our overall regressions across all income groups. The difference between the first and the second pair of regressions lies in the specification of the income group. For both specifications, we run a tobit regression to estimate the actual ganyu labour supply function (Regr. 1 and 3), and a probit regression to estimate the probability to enter the ganyu market on the supply side (Regr. 2 and 4).

Our control variables generally show the expected coefficients – a fact that we interpret as a positive sign for the general reliability of our specification. In the tobit regressions, all variables indicating higher own-farm productivity (experience and education of the household head, and the opportunity to also cultivate crops in the dry season) show a significant negative relationship with ganyu supply, while the reduced own-farm production possibilities reflected in a small farm area, are positively related to ganyu supply. Non-labour income or wealth as indicated by the iron roof affects ganyu supply negatively. And the number of adult household members (as opposed to the share of dependents) has a positive impact on ganyu supply. Households living in the northern part of the country are substantially less involved in ganyu supply than those in the south. For all but a few variables, the probit estimation points in the same direction.[3] The two exceptions are female headed households whose positive effect on ganyu is significant only in the probit model, and crop cultivation during the dry season which, surprisingly, appears to lead to a higher probability to enter the ganyu market (while reducing the expected number of days of ganyu supplied).

Let us now turn to the actual variables of interest to test our hypotheses. We observe that the ganyu wage has a highly significant positive effect throughout. Hypothesis 1 postulates that this is true for all but the households around subsistence level, an issue that

[3] The tobit model actually works under the assumption that the underlying decision making process for entry and supply (given entry) work in the same way. If this assumption is true, we should find similar effects. If we find relevant differences in the signs of a number of coefficients between the probit and the tobit model, tobit coefficients for days of ganyu (given ganyu days>0) will be biased towards the coefficients of the probit estimations. This implies that if we do find differences in coefficients, the actual differences between the market entry and the supply decision can be expected to be even bigger. This is of a certain interest here as our theoretical discussion implies some differences with respect to the impact of the shock variables.

will be tested later in our regressions differentiating by expenditure group. On average, this may lead to the positive effect found in Regressions 1-4.

Being at or under the subsistence level has a strong and significant positive effect on both the amount ganyu supplied and on the probability to enter the ganyu market. Households under the subsistence level have a 10% higher probability to be involved in any ganyu, and then, on average, supply 11 more days than otherwise comparable families above the subsistence level. However, Regressions 3 and 4 reveal that this effect is in fact not a single 'jump' in ganyu supply related to the subsistence constraint. Rather, we observe a relatively smooth increase of ganyu supply (and of the probability of market entry), if we move from the richer to the poorer expenditure quintiles. Thus, clearly, ganyu supply is much more relevant for poorer households, but a strong influence of the subsistence constraint, as claimed by Hypothesis 2, does not find any empirical support in our data.

Household shocks significantly increase the supply of ganyu days. This provides some support to Hypothesis 3 of ganyu as an ex-post coping mechanism. Interestingly, the effect is strongest if the shock is related to death or illness of household members even though this implies a simultaneous loss in family labour. Moreover, in line with Hypothesis 5 on social insurance, neither of the household shocks has a significant effect on the probability to enter the ganyu market on the supply side. Village level shocks are insignificant in all of the overall regressions.

<< Insert Table 2 about here>>

Moving to the regressions by expenditure quintile, we will be able to see whether the overall effects presented in Table 2 mask differences between income groups. The complete sets of results for both the tobit and the probit are displayed in the Annex, Table A2 and Table A3 respectively. The effects of the control variables generally correspond to those in

the overall model and will not be discussed in detail here. Instead, we will present a detailed comparison of coefficients by expenditure group for our most relevant explanatory variables, i.e. the shock variables and the wages.

Table 3 presents the effects of the two household level shocks and the village level shock on ganyu supply and the probability to supply labour in the ganyu market. The tobit models show that for all but the 5th expenditure quintile, at least some of the shocks show a significant effect on ganyu supply. As the wealthiest income group seems to be generally less involved in ganyu supply, the lack of any impact of a shock is not really surprising in this context. The coping strategy suggested by Hypothesis 3 does not appear to be relevant to these households. The coefficients of household shocks are generally positive, ranging from an increase in ganyu supply of over 5 days for the poorest quintile to below 2 days for the wealthier quintiles. As opposed to the overall regression, we now also find some significant coefficients for the village level shocks. While it is significantly positive in the 4th quintile, it is significantly negative in the 1st quintile. This explains why the effect cancels out in the overall equation.

How can we explain the negative coefficient of the village shock variable for the lowest expenditure quintile? As a village level shock implies that many families are affected simultaneously, they might all want to supply more ganyu while ganyu opportunities remain limited or even shrink. In this event, it seems that the extremely poor have considerably less chances to be hired than prospective ganyu workers from higher income groups. Thus in fact, these poor families may want to use ganyu as a coping strategy, but effectively can do so only in case of individual household shocks that do not affect a whole village population. Hypothesis 4 of ganyu being an ex-post coping strategy especially for the poor can thus not be accepted without qualification. Clear evidence for this hypothesis exists only for household level shocks.

Let us now examine which quintiles may use ganyu as an ex-ante networking or social insurance strategy. Looking at the results of our probit estimations we see that shocks have hardly any influence on the probability of households to enter the ganyu market. Only in two cases, one of the household shocks turns out to be marginally significant. One of these is in the 5th quintile which may have better market access options anyway and may not need networking through ganyu. For instance, other households may benefit from a relationship with these wealthier families, and therefore be happy to help out when such a family is struck by a crisis, which is anyway expected to be rapidly overcome.

In so far as the insurance effect is concerned, the most interesting case appears to be that of quintile 4. In this quintile, as mentioned above, the village shock effect is positive and significant in the tobit regression, i.e. despite restricted demand these households manage to effectively supply more ganyu in the aftermath of village level shocks. However, this does not seem to hold in the case of entry into the ganyu market. Thus, households benefit from increased ganyu supply possibilities only conditional to already being in the market. This provides some evidence for Hypothesis 6 which suggests a social insurance effect mostly for intermediate income groups.

For the poorest quintiles, shocks do not significantly change the probability to enter the market, either. However, as stated before, even if these households are already in the market, they can increase their ganyu supply in case of special need only when the shock is restricted to the level of the individual household. Thus for the very poor, the social insurance strategy does not seem to work in the case of wide-spread, village level shocks. This is, of course, a very serious limitation to the benefits of ganyu as a social networking strategy.

<< Insert Table 3 about here>>

Let us now examine the wage effect by expenditure quintile which is presented in Table 4. Following Hypothesis 1 and the Dessing (2002) argument on the bends of the off-farm labour supply curve, we expect households around the subsistence level, i.e. in the second expenditure quintile, to respond to falling wages by increasing their ganyu supply. For our hypothesis, only the tobit results are directly relevant.

We find that all coefficients are positive, highly significant, and very similar in size, in contrast to what Hypothesis 1 suggests. In all expenditure quintiles, an increase of the daily wage rate by 1 MK leads to between 0.19 and 0.25 more days of ganyu supplied. There is no evidence at all for a negatively sloped ganyu supply curve in any of the income quintiles.

While this does not necessarily contradict the general argument that closeness to the subsistence constraint leads to a dominance of the income effect over the substitution effect in general, there is no evidence that this is the case in the ganyu market. The need for the very poor to compensate for falling wages through more work does not lead to more ganyu supply, but possibly to more labour on one's own farm. As Hypothesis 2 has already been rejected on the basis of the overall regressions, the whole argument of ganyu as a last resort strategy to ensure food security and to comply with a given subsistence constraint does not seem appropriate. The evidence against both Hypothesis 1 and 2 also contradicts the belief, articulated in some of the literature on Malawi, that ganyu typically pushes households into a poverty trap. This is consistent with the recent results by Orr et al. (2009).

<< Insert Table 4 about here>>

One additional outcome from our empirical analysis, highlighted in Table 4 is, however, that the poor may find it more difficult to benefit from rising wages, if they are not in the ganyu market in the first place. This is what we find when looking at the results of the probit estimation. Only for households in the highest two expenditure quintiles, a rise in the

ganyu wage leads to a significantly increased probability to enter the ganyu market. By analogy with the insurance argument, this implies that there may be a good reason – especially for the poor – to always participate in the ganyu market to some extent. In that case, they are in the market, and the corresponding link to the employer seems to help them in situations in which they might want to increase their supply, either in case of household shocks or in case of ganyu being more attractive due to higher wage rates.

6. Conclusion

Ganyu labour – often described in the literature as a paradoxical risk management mechanism which eventually pushes households into a spiral of ever greater destitution – is an important feature of rural Malawi. Using data from the Second Integrated Household Survey for 2004 (Malawi Government, 2004) we do find evidence for ganyu as a risk management strategy in two ways: it is used as an ex-post strategy to cope with shocks, but also as an ex-ante strategy to make sure that extra supply in periods of need will actually be possible. This second strategy resembles some kind of an implicit social insurance mechanism. However, this insurance does not work for the very poor when village level shocks strike. In these situations, extremely poor households often have to reduce their off-farm labour even if they have been in the market before the shock. For them, the insurance strategy appears to work only in the event of individual household shocks.

Generally, ganyu supply is clearly more frequent among the poor. However, we do not find any specific link between ganyu supply and households living at or under the subsistence level. Rather, there seems to be a relatively smooth common relationship between income and ganyu supply across all expenditure levels. In addition, there is no evidence for a negative effect of wages on supply. Throughout all expenditure quintiles, households significantly increase ganyu supply in response to a rise in wages. However, for the poor, an actual

increase in the probability to enter the ganyu market in order to benefit from higher wages appears to be difficult.

Overall, in our analysis, ganyu does not appear as a mechanism which would drive households into destitution. While poverty traps certainly exist in Malawi, they do not appear to be induced by ganyu labour. To the contrary, ganyu may help families to effectively cope with shocks. Indeed, a severe problem for the poorest households seems to be the fact that they are often not able to supply additional ganyu in the event of village level shocks affecting a large part of the population. When many people want to supply ganyu and ganyu opportunities are restrained, the very poor seem to face the greatest difficulty in finding employment in the ganyu market.

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Table 1: Characteristics of agricultural households in Malawi (population estimates)

	Ganyu supplying households (no demand)	Ganyu demanding households (no supply)	Households with both supply and demand of ganyu	Households with neither supply nor demand of ganyu
Share of households	43.69% [42.06% - 45.34%]	16.10% [14.97% - 17.29%]	8.57% [7.89% - 9.29%]	31.64% [30.09% - 33.24%]
Share of households below the poverty line	25.68% [23.61% - 27.74]	3.78% [2.88% - 4.68%]	9.94% [7.69% - 12.19%]	16.63% [14.74% - 18.52%]
Share of severely underweight children under 5 years (weight for age, -3 sd)	8.67% [7.39% - 9.99%]	4.87% [3.49% - 6.24%]	6.06% [4.15% - 7.97%]	7.59% [6.02% – 9.16%]
Share of households with iron roof	8.10% [7.12% - 9.08%]	51.03% [47.36% - 54.69%]	28.64% [24.64% - 32.63%]	17.66% [15.75% - 19.58%]
Average number of household members	4.65 [4.57 – 4.73]	4.87 [4.73 – 5.01]	5.22 [5.06 – 5.38]	4.26 [4.16 – 4.36]
Share of female headed households	26.82% [25.43% – 28.21%]	15.37% [13.53% – 17.21%]	17.83% [15.00% - 20.65%]	25.58% [23.89% - 27.26%]
Average education of household head (years of schooling; range 0-19)	3.37 [3.24 – 3.49]	6.90 [6.59 – 7.21]	5.08 [4.79 – 5.37]	4.10 [3.93 – 4.27]
Share of households growing maize	96.17% [95.26% - 97.07%]	98.39% [97.68% - 99.10%]	98.71% [97.99% - 99.44%]	93.78% [92.57% - 94.99%]
Share of households growing cash crops (tobacco, cotton or hybrid maize)	60.75% [58.31% - 63.19%]	74.72% [72.15% - 77.28%]	70.37% [66.75% - 74.00%]	59.38% [56.96% - 61.79%]
Average number of different crops (rainy season)	3.22 [3.13 – 3.32]	3.50 [3.35 – 3.66]	3.58 [3.41 – 3.76]	3.04 [2.94 – 3.14]
Share of land uncultivated	26.19% [24.05% - 28.34%]	19.45% [17.11% - 21.80%]	25.99% [22.81% - 29.17%]	24.27% [21.78% - 26.75%]

Note: 95% confidence intervals in parentheses. All population estimates take into account the stratified sample structure as well as household weights (using STATA survey data commands).

Table 2: Determinants of ganyu supply and the probability to enter the ganyu market

	Regression 1 **Tobit** **E(ganyu days | ganyu days>0)**	**Regression 2** **Probit** **Pr(ganyu days>0)**	**Regression 3** **Tobit** **E(ganyu days| ganyu days>0)**	**Regression 4** **Probit** **Pr(ganyu days>0)**
Wage				
Ganyu wage	0.19*** (0.00)	0.0009** (0.02)	0.21*** (0.00)	0.001*** (0.00)
Shocks				
Household personal shock	2.62** (0.01)	0.02 (0.16)	2.83** (0.01)	0.02 (0.12)
Household property shock	1.77* (0.09)	0.01 (0.48)	2.06* (0.05)	0.01 (0.32)
Village shock	-0.02 (0.97)	0.007 (0.64)	-0.02 (0.97)	0.007 (0.64)
Productivity				
Small plot	2.65*** (0.00)	0.04*** (0.00)	2.02** (0.02)	0.03*** (0.01)
Dry season cultivation	-1.09 (0.19)	0.04*** (0.00)	-0.64 (0.44)	0.05*** (0.00)
Education	-1-60*** (0.00)	-0.02*** (0.00)	-1.38*** (0.00)	-0.01*** (0.00)
Age household head	-0.26*** (0.00)	-0.004*** (0.00)	-0.24*** (0.00)	-0.003*** (0.00)
Wealth				
Iron roof	-17.44*** (0.00)	-0.23*** (0.00)	-15.34*** (0.00)	-0.21*** (0.00)
Ultra poor	10.66*** (0.00)	0.1*** (0.00)		
Expenditure quintile 1			22.93*** (0.00)	0.24*** (0.00)
Expenditure quintile 2			16.76*** (0.00)	0.17*** (0.00)
Expenditure quintile 3			11.65*** (0.00)	0.13*** (0.00)
Expenditure quintile 4			4.40*** (0.00)	0.06*** (0.00)
Household characteristics				
Adults	5.87*** (0.00)	0.05*** (0.00)	4.66*** (0.00)	0.03*** (0.00)
Female household head	1.46 (0.16)	0.04*** (0.00)	1.45 (0.16)	0.05*** (0.00)
Dependents	-1.02 (0.57)	-0.03 (0.20)	-9.04*** (0.00)	-0.12*** (0.00)
North	-10.87*** (0.00)	-0.12*** (0.00)	-10.94*** (0.00)	-0.12*** (0.00)
Wald (F-Test for probit)	Chi2(14)=692.26 (0.00)	F(14, 411)=49.62 (0.00)	Chi2(17)=714.05 (0.00)	F(17, 408)=43.62 (0.00)
N	9994	9994	9994	9994

Notes: Marginal effects or discrete change of dummy variables from 0 to 1.
P values in parentheses;* p<0.1, ** p<0.05, *** p<0.01.
The stratified sample structure is taken into account in the estimation of standard errors [using the Huber-White sandwich estimator for probit, and bootstrapping (500 replications) for tobit].
Constant term not presented here.
Quintile 5 (the richest quintile) is used as the comparison group.

Table 3: Shock effect on ganyu supply and the probability to enter the ganyu market for different expenditure quintiles

Dependent variable: ganyu days		Tobit: E(ganyu days | ganyu days>0)	Probit: Pr(ganyu days>0)
Expenditure quintile 1	Household personal shock	5.02 (0.10)	0.04 (0.15)
	Household property shock	5.90** (0.04)	0.02 (0.54)
	Village shock	-6.64*** (0.00)	-0.03 (0.32)
Expenditure quintile 2	Household personal shock	5.37* (0.09)	0.04 (0.23)
	Household property shock	2.52 (0.43)	-0.009 (0.78)
	Village shock	0.21 (0.92)	-0.01 (0.63)
Expenditure quintile 3	Household personal shock	0.36 (0.88)	-0.04 (0.16)
	Household property shock	4.48* (0.05)	0.06* (0.07)
	Village shock	-0.50 (0.78)	0.02 (0.39)
Expenditure quintile 4	Household personal shock	1.79 (0.36)	0.02 (0.33)
	Household property shock	1.80 (0.33)	0.025 (0.41)
	Village shock	2.38* (0.09)	0.02 (0.24)
Expenditure quintile 5	Household personal shock	2.79 (0.13)	0.06* (0.07)
	Household property shock	-0.88 (0.57)	0.003 (0.90)
	Village shock	1.70 (0.23)	0.01 (0.48)

Source: Annex Tables A2 and A3.

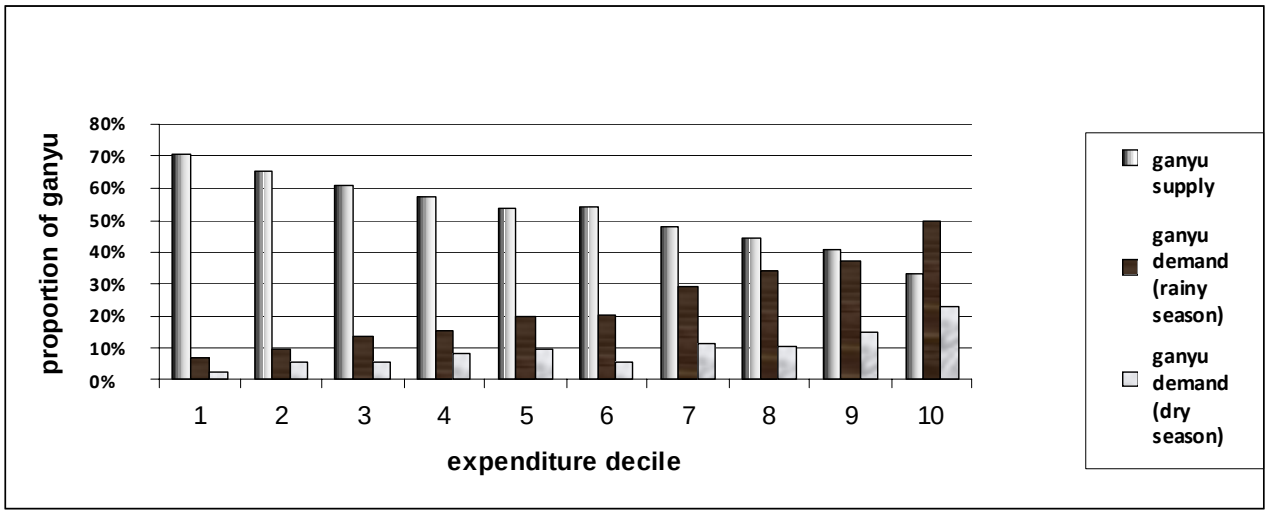
Notes: Effect of a change of the shock variables from 0 to 1 (at the mean of all other variables).
P values in parentheses;* p<0.1, ** p<0.05, *** p<0.01.
The stratified sample structure is taken into account in the estimation of standard errors [using the Huber-White sandwich estimator for probit, and bootstrapping (500 replications) for tobit].

Table 4: Wage effect on ganyu supply and the probability to enter the ganyu market for different expenditure quintiles

Effect of ganyu wage on days ganyu	Tobit: E(ganyu days | ganyu days>0)	Probit: Pr(ganyu days>0)
Expenditure quintile 1	0.19*** (0.00)	-0.006 (0.45)
Expenditure quintile 2	0.21*** (0.00)	-0.0005 (0.42)
Expenditure quintile 3	0.21*** (0.00)	0.0009 (0.13)
Expenditure quintile 4	0.25*** (0.00)	0.002*** (0.00)
Expenditure quintile 5	0.19*** (0.00)	0.002*** (0.00)

Source: Annex Tables A2 and A3.
Notes: Marginal effects; p values in parentheses;* p<0.1, ** p<0.05, *** p<0.01.
The stratified sample structure is taken into account in the estimation of standard errors [using the Huber-White sandwich estimator for probit, and bootstrapping (500 replications) for tobit].

Figure 1: Share of households supplying or hiring ganyu for different expenditure decile



Note: A distinction between the rainy and the dry season is not available for ganyu supply.

Figure 2: Share of households involved in ganyu by season and district

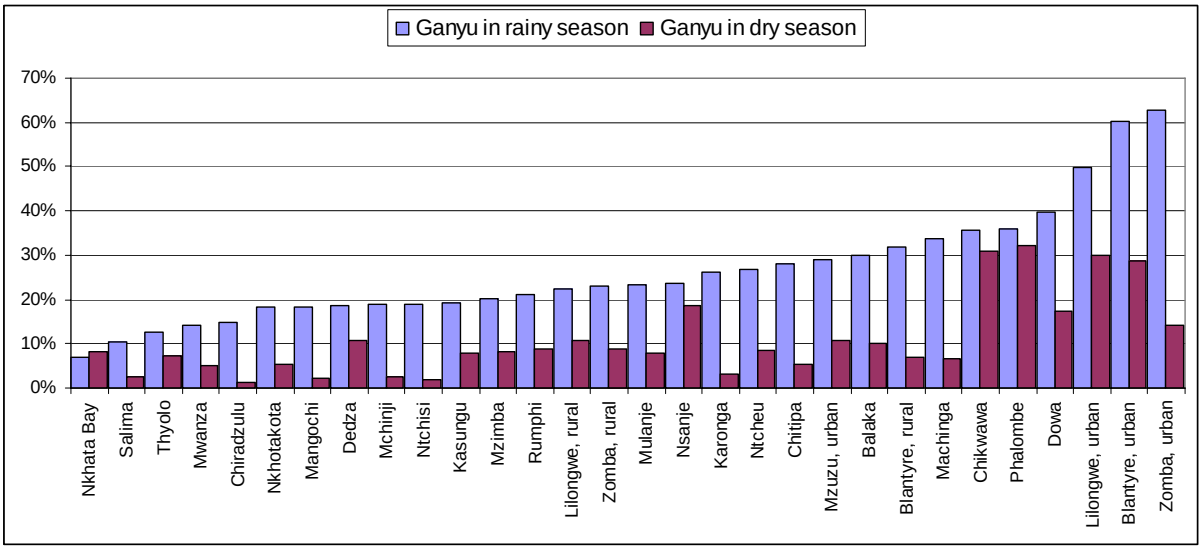
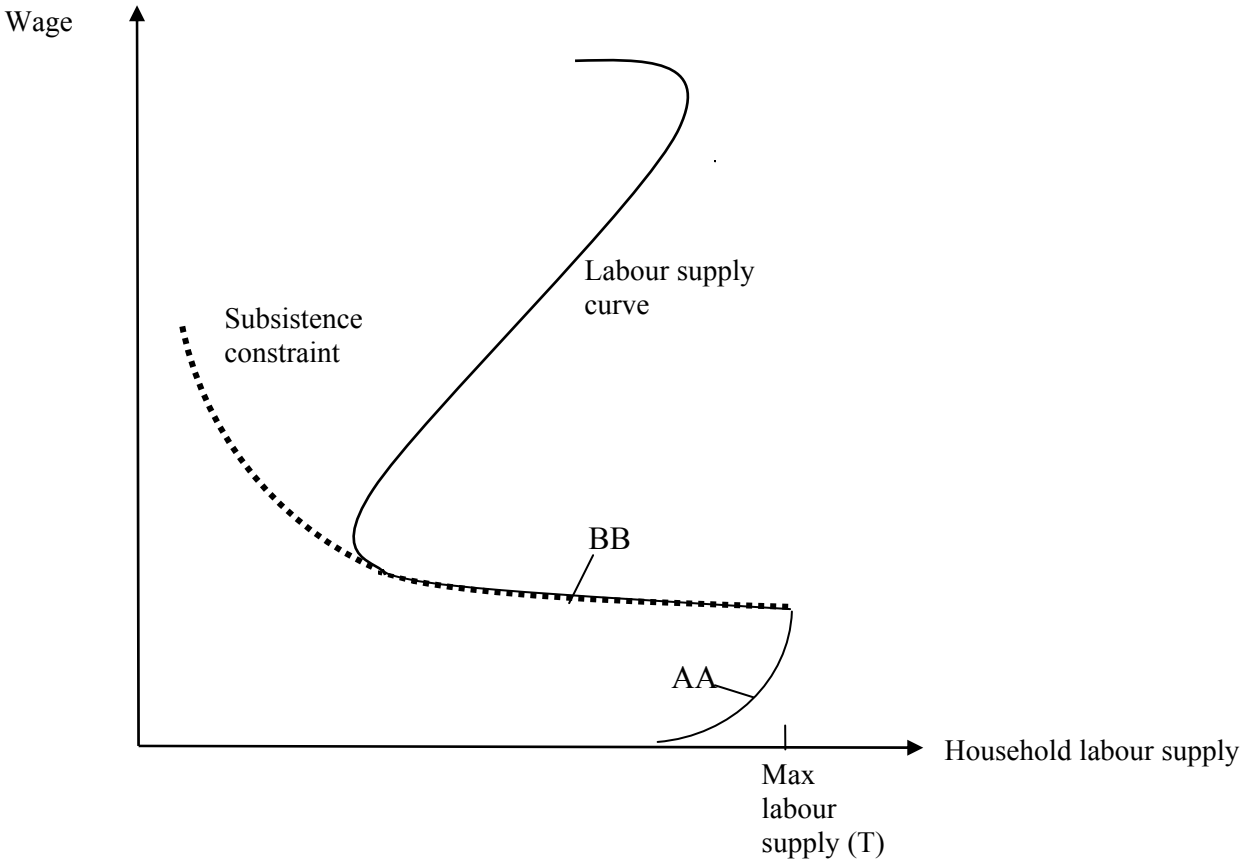


Figure 3: Labour supply and the subsistence constraint



Source: Dessing (2002: 440).

Note: The subsistence constraint includes all wage-labour combinations that just ensure a (fixed) minimum subsistence income. Any points in the segment BB of the labour supply curve just ensure subsistence. Below the subsistence constraint, T depends on the wage rate and labour supply adjusts to this constraint (segment AA).

Annex

Table A1: Variable definitions and descriptive statistics

Variable	Definition	Mean	Std	Min	Max
Ganyu days	No. of days a household supplies ganyu labour (per year) (>0 for 52% of all households)	36.25	71.77	0	1249
Ganyu wage	Regional wage paid for a day of ganyu in Malawi Kwacha	70.01	21.10	34.62	119.19
Household personal shock	= 1 if household head died or a working member turned ill/had an accident in this year, 0 otherwise	0.16	0.37	0	1
Household property shock	= 1 if household experienced a shock for livestock died or stolen, other theft in this year, dwelling damaged	0.16	0.38	0	1
Village shock	= 1 if village experienced droughts, floods, crop disease, crop pest, or a rise in food price in the past year, 0 otherwise	0.41	0.49	0	1
Small plot	= 1 if household's farm land is smaller than 0.5 hectares, 0 otherwise	0.31	0.46	0	1
Dry season cultivation	= 1 if households cultivate any type of subsistence crop in the dry season, 0 otherwise	0.36	0.48	0	1
education	Years of schooling of household head	4.31	3.97	0	19
Age household head	Age of household head	43.29	16.52	14	103
Iron roof	= 1 if household's roof is made of iron sheets, clay tiles or concrete, 0 otherwise	0.19	0.39	0	1
Expenditure quintile 1 - 5	Expenditure quintiles with 1 lowest and 5 highest			0	1
Ultra poor	= 1 if household is unable to purchase enough food to meet caloric requirements for subsistence, 0 otherwise	0.17	0.38	0	1
Adults	No. of individuals 15-64 years of age per household	2.27	1.22	0	11
Female household head	= 1 if household head is female, 0 otherwise	0.23	0.42	0	1
Dependents	no. of children (0-14 years) and elderly (over 64 years) divided by no. of total household members	0.46	0.24	0	1
North	= 1 if household lives in the Region North, 0 otherwise	0.10	0.30	0	1

Notes: The stratified sample structure and weights are taken into account in the descriptive statistics.

Table A2: Determinants of ganyu supply for different expenditure quintiles

Tobit Estimated effects on E(ganyu days ¦ ganyu days>0)	**Expenditure quintile 1**	**Expenditure quintile 2**	**Expenditure quintile 3**	**Expenditure quintile 4**	**Expenditure quintile 5**
Wage					
Ganyu wage	0.19*** (0.00)	0.21*** (0.00)	0.21*** (0.00)	0.25*** (0.00)	0.19*** (0.00)
Shocks					
Household personal shock	5.02 (0.10)	5.37* (0.09)	0.36 (0.88)	1.79 (0.36)	2.79 (0.13)
Household property shock	5.90** (0.04)	2.52 (0.43)	4.48* (0.05)	1.80 (0.33)	-0.88 (0.57)
Village shock	-6.64*** (0.00)	0.21 (0.92)	-0.50 (0.78)	2.38* (0.09)	1.70 (0.23)
Productivity					
Small plot	4.22* (0.09)	3.32 (0.22)	-0.08 (0.96)	2.57* (0.07)	0.836 (0.56)
Dry season cultivation	-5.63** (0.01)	1.17 (0.60)	2.48 (0.18)	0.77 (0.58)	-3.06** (0.03)
Education	-1.00*** (0.00)	-1.09*** (0.00)	-1.07*** (0.00)	-1.35*** (0.00)	-1.50*** (0.00)
Age household head	-0.009 (0.90)	-0.25*** (0.00)	-0.31*** (0.00)	-0.23*** (0.00)	-0.29*** (0.00)
Wealth					
Iron roof	-20.24*** (0.00)	-9.46** (0.01)	-12.97*** (0.00)	-12.77*** (0.00)	-16.08*** (0.00)
Household characteristics					
Adults	6.79*** (0.00)	5.73*** (0.00)	4.59*** (0.00)	2.70*** (0.00)	4.58*** (0.00)
Female household head	1.94 (0.51)	3.75 (0.15)	6.07** (0.01)	-0.47 (0.78)	0.02 (0.99)
Dependents	-5.30 (0.56)	-4.86 (0.40)	-7.36 (0.14)	-9.15*** (0.00)	-7.32*** (0.00)
North	-20.12*** (0.00)	-16.51*** (0.00)	-15.23*** (0.00)	-5.52*** (0.00)	-3.17* (0.08)
Wald	Chi2(13)=142.6 (0.00)	Chi2(13)=98.7 (0.00)	Chi2(13)=148.6 (0.00)	Chi2(13)=188.0 (0.00)	Chi2(13)=182.7 (0.00)
N	1588	1872	2010	2207	2317

Notes: Marginal effects or discrete change of dummy variables from 0 to 1.
P values in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
The stratified sample structure is taken into account in the estimation of standard errors [using the Huber-White sandwich estimator for probit, and bootstrapping (500 replications) for tobit].
Constant term not presented here.

Table A3: Determinants of ganyu market entry for different expenditure quintiles

Probit Estimated effects on Pr(ganyu days>0)	**Expenditure quintile 1**	**Expenditure quintile 2**	**Expenditure quintile 3**	**Expenditure quintile 4**	**Expenditure quintile 5**
Wage					
Ganyu wage	-0.006 (0.45)	-0.0005 (0.42)	0.0009 (0.13)	0.002*** (0.00)	0.002*** (0.00)
Shocks					
Household personal shock	0.04 (0.15)	0.04 (0.23)	-0.04 (0.16)	0.02 (0.33)	0.06* (0.07)
Household property shock	0.02 (0.54)	-0.009 (0.78)	0.06* (0.07)	0.025 (0.41)	0.003 (0.90)
Village shock	-0.03 (0.32)	-0.01 (0.63)	0.02 (0.39)	0.02 (0.24)	0.01 (0.48)
Productivity					
Small plot	0.05 (0.10)	0.02 (0.31)	0.02 (0.45)	0.04* (0.05)	0.04* (0.07)
Dry season cultivation	-0.003 (0.91)	0.06** (0.03)	0.10*** (0.00)	0.08*** (0.00)	-0.01 (0.64)
Education	-0.01** (0.01)	-0.009 (0.02)	-0.009** (0.01)	-0.02*** (0.00)	-0.02*** (0.00)
Age household head	-0.001 (0.22)	-0.002*** (0.00)	-0.003*** (0.00)	-0.004*** (0.00)	-0.005*** (0.00)
Wealth					
Iron roof	-0.23*** (0.00)	-0.17*** (0.00)	-0.18*** (0.00)	-0.18*** (0.00)	-0.24*** (0.00)
Household characteristics					
Adults	0.03** (0.03)	0.02* (0.05)	0.03*** (0.00)	0.02** (0.02)	0.05*** (0.00)
Female household head	0.04 (0.11)	0.09*** (0.00)	0.13*** (0.00)	0.02 (0.47)	-0.01 (0.74)
Dependents	-0.16 (0.11)	-0.12 (0.11)	-0.12* (0.06)	-0.13** (0.01)	-0.09** (0.04)
North	-0.18*** (0.00)	-0.19*** (0.00)	-0.18*** (0.00)	-0.04 (0.25)	-0.05 (0.18)
F-Test	F(13, 412)=6.08 (0.00)	F(13, 412)=7.36 (0.00)	F(13, 412)=11.3 (0.00)	F(13, 412)=10.2 (0.00)	F(13, 412)= 21.8 (0.00)
N	1588	1872	2010	2207	2317

Notes: Marginal effects or discrete change of dummy variables from 0 to 1.
P values in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
The stratified sample structure is taken into account in the estimation of standard errors [using the Huber-White sandwich estimator for probit, and bootstrapping (500 replications) for tobit].
Constant term not presented here.